GOUR MAHAVIDYALAYA, MANGALBARI, MALDA
DEPARTMENT: BOTANY

LESSON PLAN FOR NEP MAJOR
2024-25
YEAR 1
SEMESTER I

PAPER	TOPIC	SUB TOPIC	NUMBER OF LECTURES	TEACHERS NAME
BOT-DC-MJ-101 : Diversity of Cryptogams	**Algae**	General characteristic features. cell structures, range of thallus, Ecological and economic importance.	1-4	D.S
	Fungi	General characteristic features, cell structure, fruiting bodies, similarities with plants and animals, ecological and economic importance.	5-8	S.S
	Lichen	General characteristic features, cell structure, fruiting bodies, ecological and economic importance.	9-10	P.S
	Bryophytes	General characteristic features, adaptation to land habit, difference between liverworts and hornworts, ecological and economic importance.	11-15	P.D
	Pteridophytes	General characteristic features, differences among fern and non-fern plants, ecological and economic importance.	16-20	D.R

SEMESTER II

PAPER	TOPIC	SUB TOPIC	NUMBER OF LECTURES	TEACHERS NAME
BOT-DC-MJ-201 : Diversity of Phanerogams	**Gymnosperm**	General characteristic features, difference between cycads and conifers, distribution in India, ecological and economic importance. (wood character with special reference to timber)	21-26	D.R
	Angiosperm	General characteristic features, difference between dicots and monocots, plant forms- herbs, shrubs, trees & climbers, ecological and economic importance (with special reference to food crops).	27-32	S.S
	Morphology of Angiosperm:	General structures, types and functions of- Leaf, Stem, Root, Flower and Fruits. Pollen grains with types (porate, colpate,colporate)	33-37	D.S
	Plant Nomenclature	Brief idea of binomial nomenclature.	38-43	P.D
	Contribution of Eminent Botanists	John Ray, Carl Linneaus, George Benthum & Joseph Dalton Hooker, Gregor Johann Mendel, Charles Darwin, James D. Watson & Francis Crick, N.I. Vavilov, Norman Borlaug, Jagadish Chandra Bose, Birbal Sahni, Panchanan Maheswari, M.S. Swaminathan, Arun Kumar Sharma.	44-50	P.S

YEAR 2

SEMESTER III

PAPER	TOPIC	SUB TOPIC	NUMBER OF LECTURES	TEACHERS NAME
BOT-DC-MJ-301 : Gymnosperm & Palaeobotany	**Gymnosperm**	[1] General characters and classification by Stewart and Rothwell, 1993 (up to order)	50-54	P.D
		[2] Ecological and economic importance of Gymnosperms.	55-58	D.S
		[3] Vegetative morphology, anatomy and reproductive structures, development of gametophytes and embryogeny of *Cycas* sp., *Pinus* sp. and *Gnetum* sp.	59-68	S.S
		[4] Fossil gymnosperms: Structural features, geographical and geological distribution of reconstructed genera: *Lyginopteris* sp., *Williamsonia* sp. and *Cordaites* sp.	69-75	D.R
	Paleobotany	[5] Fossil: types and modes of preservation (Schopf, 1975), conditions of preservations, fossilization process.	76-80	S.S
		[6] Geological time scale and major events of plant life through geological ages.	81-86	D.R
		[7] Gondwana – an overview of Indian Gondwana flora.	87-95	P.D
		[8] Importance of study of fossil.	96-104	D.S

SEMESTER IV

PAPER	TOPIC	SUB TOPIC	NUMBER OF LECTURES	TEACHER S NAME
Major Course -6 (MC-6) : Plant Anatomy and Plant Ecology	**Plant Anatomy**	**[1] Introduction and scope of Plant Anatomy:** Applications in systematics, forensics and pharmacognosy.	104-110	P.D
		[2] Structure and Tissues system: Classification of tissues; Simple and complex tissues (no phylogeny); cytodifferentiation oftracheary elements and sieve elements; Pits and plasmodesmata; Wall ingrowths and transfer cells, encrustation and incrustation, Ergastic substances. Hydathodes, cavities, lithocysts andlaticifers.	110-118	S.S
		[3] Apical meristems: Meristimatic and permanent tissues: Organization of shoot apex (Tunica-corpus concept) and organization of root apex (Korper-Kappe concepts); Structure of dicot and monocot leaf, Kranz anatomy. Structure of Xylem and Phloem tissue; Types and evolution of stele; Vascular bundle -types and function. Root-Stem transition and its significance;	119-128	D.R
		[4] Vascular Cambium and Wood: Basic concepts of cambium; Secondary growth in root and stem. Axially and radially oriented elements; Types of rays and axial parenchyma; Cyclic aspects and reaction wood; Sapwood and heartwood; Normal and Anomalous secondary growth (citing examples of *Dracaena*stem, *Bignonia*stem, *Tinospora* root, Orchid root), different types of wood. Concept and application of Dendrochronology.	129-137	P.D
		[5] Adaptive and Protective Systems: Epidermal tissue system, cuticle, epicuticular waxes, trichomes (uni-and multicellular, glandular and no glandular, two examples of each), stomata (classification); Development and composition of periderm, rhytidome and lenticels.Adcrustation and incrustation; Anatomical adaptations of xerophytes and hydrophytes.	138-145	S.S
	Plant Ecology	**[1] Introduction:** Basic concepts; Levels of organization. Inter-relationships between the living world and the environment.	146-152	P.D
		[2] Soil and Water: Importance; Origin, Formation; Composition; Physical; Chemical and Biological components; Precipitation types		

Major Course -7 (MC-7) : Plant Physiology	**Plant Physiology**	(rain, fog, snow, hail, dew); Hydrological Cycle; Water in soil (concept only); Water table. **[3] Light, temperature, wind and fire:** Variations; adaptations of plants to their variation. **[4] Biotic interactions:** Trophic organization, basic source of energy, autotrophy, heterotrophy; symbiosis, commensalism, parasitism; food chains and webs; biomass, standing crop. **[5] Population ecology:** Characteristics and Dynamics, Ecological Speciation **[6] Plant communities:** Habitat and niche; Characters: analytical and synthetic; Ecotone and edge effect; Dynamics: succession – processes, types; climax concepts. **[7] Ecosystems:** Structure; Processes; Food chains and Food webs; Ecological pyramids. **[8] Functional aspects of ecosystem:** Principles and models of energy flow; Production and productivity; Ecological efficiencies; Biogeochemical cycles; Cycling of Carbon, Nitrogen and Phosphorus. **[1] Plant-water relations:** Water Potential and its components, water absorption by roots, aquaporin, pathway of water movement, symplast, apoplast, trans membrane pathways, root pressure, guttation. Ascent of sap– cohesion-tension theory. Transpiration and factors affecting transpiration, antitranspirants, mechanism of stomatal movement. Cavitation and ambolism. **[2] Mineral nutrition:** Essential and beneficial elements, macro and micronutrients. **[3] Nutrient Uptake:** Transport of ions across cell membrane, passive absorption, electrochemical gradient, facilitated diffusion, active absorption. Proton ATPase pump and ion flux, uniport, co-transport, symport, antiport. [4] **Carbon assimilation**: photosynthetic pigmentsandtheirrole (chlorophylls and accessory pigments), antenna molecules and reaction centres, photochemical reactions, photosynthetic electron transport, PSI, PSII, CO_2 reduction, photorespiration, C4 pathways; CAM and its ecological significance. Factors affecting CO_2 reduction.	153-165 166-170 171-178 179-185 186-192 193-199 200-212 213-220 221-229 230-238 239-245	S.S D.R P.S D.S P.S D.R S.S D.S D.S D.R S.S

		[5] Carbon Oxidation: Glycolysis and its significance, fate of pyruvate, oxidative pentose phosphate pathway,TCA cycle, mitochondrial electron transport, oxidative phosphorylation, factors affecting respiration.	246-255	D.S
		[6] **Translocation in the phloem:** Phloem loading and unloading; Source–sink relationship.	256-260	D.S
		[7] Transpiration: Stomata – Transpiration role and significance. Role of CO_2, K+ - ion, blue light & abscisic acid in stomata movement; Anti-transparent.	261-267	D.S
		[8] Plant growth regulators: Introduction to Plant growth hormones/regulators. Types of plant growth regulators**.** Physiological roles of Auxin, Gibberellins, Cytokinin, Abscisic acid, Ethylene, Brassinosteroids and Jasmonic acid. Commercial Plant Growth Hormones examples and uses.	268-277	P.D
		[9] Physiology of flowering: Photoperiodism, flowering stimulus, foreign concept, vernalization.	278-285	S.S
		[10] Photochromic, cytochromes and phototropism: Discovery, chemical nature, role in photo morphogenesis, low energy responses (LER) and high irradiance responses (HIR)	286-292	D.S
		[11] Seed Dormancy: Types, causes and methods of breaking seed dormancy.	293-300	D.S

YEAR 3

SEMESTER V

PAPER	TOPIC	SUB TOPIC	NUMBER OF LECTURES	TEACHERS NAME
BOT-DC-MJ-501:Evolution of Early Land Plants	**Bryophytes and Pteridophytes**	[1] Introduction / Evolutionary emergence of land plants: Evolution from thallophyta to early land plants and gradual progression from aquatic habit to land habit, Evolution and complexity of sporophyte (telome theory); Alternation of generations. [2] **Bryophytes:** General characteristics; Adaptations to land habit; Classification (Proskauer, 1957) up to class. Range of thallus organization. Ecological and economic importance of bryophytes with special reference to *Sphagnum* sp. [3] Type Studies- Bryophytes: Morphology, anatomy and reproduction and sporophyte development and alternation of generation of *Marchantia* sp*, Porella* sp., *Anthoceros* sp*., Sphagnum* sp. *Funaria* sp. *and Pogonatum* sp. (Developmental details not to be included). [4] **Pteridophytes:** General characteristics; Classification up to class (Sporne, 1975); Concept of heterospory and origin of seed habit; Apogamy, and apospory; Stelar evolution. Ecological and economic importance of pteridophytes. Early land plants *Rhynia* sp .and *Lepidodendron* sp. (Reconstructed). [5] Type Studies- Pteridophytes: Morphology, anatomy and reproduction of *Psilotum*, *Lycopodium* sp., *Selaginella* sp., *Equisetum* sp. *Polypodium* sp., *Pteris* sp. and *Marsilea* sp. fossilization process.	301-310 311-324 325-333 334-346 347-352	S.S PD D.R S.S S.S
BOT-DC-MJ-502: Morphology and Taxonomy of Angiosperms	**Plant Morphology**	Introduction to angiospermic morphology, Palynology and Anatomy, scope and applications in systematics, forensic and pharmacognosy. Leaf: Types, Margin, Base, Venation and Phyllotaxy, Petiole and modifications. Inflorescence: types with examples; Flower: Floral parts, Thalamus and insertion of floral parts, Calyx, Corolla, Aestivation, Perianth, floral diagram and floral formula. Stamen: Types and anther shape. Carpel : types, placentation-types, ovule structure and	353-370	D.S

	Plant Systematics	types; Fruit types with examples. Significance of Plant systematics: Introduction to systematics; Plant identification, Classification, Nomenclature. Field inventory; Functions of Herbarium; Important herbaria and botanical gardens of the world and India; Virtual herbarium; E-flora; Documentation: Flora, Monographs, Journals; Keys. Taxonomic hierarchy: Concept of taxa (family, genus, species); Categories and taxonomic hierarchy; Species concept (taxonomic, biological, evolutionary). Botanical nomenclature: Principles and rules (ICN); Ranks and names; Typification, author citation, valid publication, rejection of names, principle of priority and its limitations; Names of hybrids Systems of classification: Major contributions of Theophrastus, Bauhin, Tournefort, Linnaeus, Adanson, de Candolle, Bessey, Hutchinson, Takhtajan and Cronquist; Outline of classification systems of Linnaeus (1753), Bentham and Hooker (1862-1883) upto series and brief reference of Angiosperm Phylogeny Group (APG III) classification. Biometrics, numerical taxonomy and cladistics: Characters; Variations; OTUs, character weighting and coding. Phylogeny of Angiosperms: Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, Paraphyly, polyphyly and clades). Origin and evolution of angiosperms; Co-evolution of angiosperms and animals; Methods of illustrating evolutionary relationship (phylogenetic tree, cladogram). Diagnostic features of Families: **Di-cotyledons-** Ranunculaceae, Brassicaceae, Malvaceae, Leguminosae (sensu lato), Apocynaceae, Solanaceae, Lamiaceae, Cucurbitaceae, Rubiaceae, Euphorbiaceae, Asteraceae. **Monocotyledons**-Alismataceae, Poaceae, Zingiberaceae and Orchidaceae. **The cell:** Cell as a unit of structure and	371-393	P.S

BOT-DC-MJ-503: Cell Biology and Plant Breeding	**Cell biology**	function, Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (End symbiotic theory). **Cell wall and membrane:** Plant cell wall, plasma membrane, models of membrane structure (fluid mosaic model), endocytosis and exocytosis. **Cell organelles (structure and function):** Nucleus, chloroplast, mitochondria, Endomembrane system, peroxisome, Lysosome. **Cytoskeleton:** microtubules, microfilaments and intermediary filament. **Cell division:** Phases of eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle-checkpoints, role of protein kinases.	394-412	S.S
	Plant Breeding	Basic concept of plant breeding, significance and role in crop improvement. Green Revolution (History, Basic concepts and significance). Selection methods in plant breeding: Mass Selection, Pure-line Selection, Pedigree Selection, Bulk Selection and hybridization. Outline idea about Male sterility, Heterocyst, Hybrid Vigour. Seed bank, Gene Bank, Germplasm-Importance and role in plant breeding.	413-425	D.R
BOT-DC-MJ-504 : Palynology and Reproductive Biology of Angiosperms	**Palynology**	**[1] Palynology and scope**: a brief account **[2] Pollen morphology:** Pollen morphology, units, polarity, symmetry, shape, size, aperture; NPC system for numerical expression of aperture details; evolution of aperture types. **[3] Pollen Viability and Storage:** Pollen Viability and Storage: Estimation; variations; responsible factors; short- and long-term storage; significance. **[4] Branches of Palynology & Application:** Branches of palynology & application: Branches of palynology; palynology in taxonomic & phylogenetic deductions; palynology in academic & applied aspects including melissopalynology, medical palynology, forensic palynology, entomopalynology&copropalynology. **[1] Reproductive development:** Induction of flowering; flower as a modified determinate	426-434	D.S

	Reproductive Biology of Angiosperms	shoot. Flower development: genetic and molecular aspects. **[2] Anther and pollen biology:** Anther wall: Structure and functions, microsporogenesis, callose deposition and its significance. micro gametogenesis, male germ unit **[3] Ovule:** Structure; Types; Special structures– endothelium, obturator, aril, caruncle and hypostase; Female gametophyte– megasporogenesis (monosporic, bisporic, tetrasporic) and mega gametogenesis (details of *Polygonum* type); Organization and ultrastructure of mature embryo sac. **[4] Pollination and fertilization:** Pollination types, agents and adaptations; pollen germination; path of pollen tube in pistil; double fertilization. **[5] Embryo, Endosperm and Seed:** Structure and types; General pattern of development of dicot and monocot embryo and endosperm; Suspensor: structure and functions; Embryo-endosperm relationship; Nutrition of embryo; Unusual features; Embryo development in *Paeonia*. Seed structure.	435-447	S.S